

Chapter 3 : Logical Reasoning

3.1 STATEMENT

MEANING

- ♥ A sentences of which the truth value can be determined, that is either true or false, but not both
- ♥ Question, exclamation and command sentences are not statement
- ♥ The truth values of these sentences cannot be determined

EXAMPLE

- ♥ "A cuboid has 8 vertices" – true statement
- ♥ "A cuboid has 12 vertices" – false statement
- ♥ Statements can be divided into true statement and false statement

NEGATION

- ♥ No or Not

EXAMPLE

- ♥ 12 is a multiple
- ♥ Negation : 12 is not a multiple of 5

COMPOUND STATEMENT

- ♥ Or or And

EXAMPLE

- ♥ p : 12 is a multiple of 5
- ♥ q : 12 is a multiple of 6
- ♥ Compound statement : 12 is a multiple of 5 or a multiple of 6
- ♥ Compound statement : 12 is a multiple of 5 and a multiple of 6

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3.1 STATEMENT

IMPLICATION

- ♥ If p , then q
- ♥ p if and only if q

EXAMPLE

- ♥ p : 12 is a multiple of 3
- ♥ q : 12 is a multiple of 6
- ♥ Implication : if 12 is a multiple of 3, then 12 is a multiple of 6
- ♥ Implication : if 12 is a multiple of 3 and only if 12 is a multiple of 6

CONVERSE, INVERSE, CONTRAPOSITIVE

- ♥ Converse : if q , then p
- ♥ Inverse : if $\sim p$, then $\sim q$
- ♥ Contrapositive : if $\sim q$, then $\sim p$

EXAMPLE

- ♥ If 12 is a multiple of 3, then 12 is a multiple of 6
- ♥ Converse : if 12 is a multiple of 6, then 12 is a multiple of 3
- ♥ Inverse : if 12 is not a multiple of 3, then 12 is not a multiple of 6
- ♥ Contrapositive : if 12 is not a multiple of 6, then 12 is not a multiple of 3

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3.2 ARGUMENT

MEANING

- ♥ The process of making a conclusion based on statements
- ♥ Can consist of several premises and one conclusion
- ♥ A premise – a statement that gives information before making a conclusion
- ♥ A conclusion – an outcome or a decision
- ♥ Simple argument consists of at least two premises and one conclusion

INDUCTIVE ARGUMENT

- ♥ Make general conclusion based on specific premises
- ♥ Strong and cogent

EXAMPLE

- ♥ Premise 1 : $2(1) - 1 = 1$
- ♥ Premise 2 : $2(2) - 1 = 3$
- ♥ Premise 3 : $2(3) - 1 = 5$
- ♥ Premise 4 : $2(4) - 1 = 7$
- ♥ Conclusion : $2n - 1 ; n = 1, 2, 3, 4, \dots$

DEDUCTIVE ARGUMENT

- ♥ Make specific conclusion based on general premises
- ♥ Valid and sound

EXAMPLE

- ♥ Premise 1 : All A is B
- ♥ Premise 2 : C is A
- ♥ Conclusion : C is B

EXAMPLE

- ♥ Premise 1 : if p, then q
- ♥ Premise 2 : p is true
- ♥ Conclusion : q is true